

Listing of Claims

1. (Original) An apparatus for tracing GTP resource, comprising:
 - a call tracing unit for receiving a command of a call tracing from an operator through MMI and performing the call tracing;
 - a call tracing DB for storing call-tracing data currently processed;
 - a GTP-U tracing unit for tracing a GTP-U message and reporting the GTP-U message to the call tracing unit;
 - a SGSN interface unit for receiving the GTP-U message outputted from the SGSN; and
 - an internet interface unit for transmitting the GTP-U message routed at the GTP-U tracing unit to an internet network.

2. (Original) The apparatus for tracing GTP resource of claim 1, further comprising a call manager for setting a call for a subscriber, searching whether GTP-C tracing function for the subscriber is set in the tracing information DB when receiving the GTP-C, and transmitting a corresponding GTP resource information to the call tracing unit when the corresponding GTP-C tracing function is set.

3. (Original) The apparatus for tracing GTP resource of claim 1, wherein the GTP-U tracing unit comprises:

a call tracing interface unit for processing a GTP-U tracing function message requested from the call tracing unit and transmitting a result of the GTP-U data tracing;

a TEID converter for converting the IMSI or IP received from the call tracing interface unit to a TEID;

a trace load controller for minimizing a load of an exchanger, the load generated from the GTP-U data tracing function;

a GTP-U traffic detector for detecting a traffic for tracing the GTP-U between the SGSN interface unit and the internet interface unit; and

a GTP-U tracing DB for storing the IMSI information for mapping the TEID and information for the GTP-U tracing.

4. (Currently Amended) A method for tracing GTP resource, comprising ~~the steps of:~~
setting a tracing function for reserved resources of a GTP-U by using a TEID for a subscriber to be traced; and

outputting information for the reserved resource by detecting the GTP-U having the tracing function set therein.

5. (Currently Amended) The method for tracing GTP resource of claim 4, wherein ~~the step of~~ setting the tracing function comprises ~~the steps of~~:
- receiving tracing information for the subscriber from an operator;
 - mapping the TEID allotted to the subscriber by using the tracing information; and
 - registering the tracing function of the GTP-U by using the TEID; and
 - storing the TEID together with the tracing information to a tracing information DB.
6. (Original) The method for tracing GTP resource of claim 5, wherein the tracing information comprises IMSI and/or IP address of the subscriber.
7. (Original) The method for tracing GTP resource of claim 6, wherein the tracing information comprises 2bits indicating a SGSN record type and a tracing type for classifying call watching, call tracing, and the user message tracing according to the SGSN record type.
8. (Original) The method for tracing GTP resource of claim 5, wherein the tracing information DB stores the tracing information, the TEID, and a trace count value notifying the number of the traced message.

9. (Currently Amended) The method for tracing GTP resource of claim 4, wherein the step of outputting information for the reserved resource information comprises ~~the steps of:~~
receiving and storing the TEID related to the registration of the GTP-U tracing function and the tracing information in a tracing information DB, and activating a tracing flag corresponding to the TEID;
confirming a TEID of the GTP-U trafficked between the SGSN and the GGSN;
confirming whether the tracing flag corresponding to the confirmed TEID is activated by searching the TEID table; and
outputting the reserved resource information of the GTP-U to the operator by using the TEID.

10. (Original) The method for tracing GTP resource of claim 9, wherein the reserved resource information comprises an AMA number of trafficked subscriber message, an interface number, a VPI/VCI, a link band, a value directing a stream direction of the data, and the trace count value.

11. (Currently Amended) The method for tracing GTP resource of claim 9, wherein the step of outputting the reserved resource information comprises ~~the steps of:~~
confirming whether the TEID is stored by searching the tracing information DB;

mapping the reserved resource information to a subscriber tracing information corresponding to the TEID and outputting the mapped subscriber tracing information to the operator when the TEID is stored;

increasing a trace count value in the tracing information and comparing the trace count value with a trace critical value; and

deleting the TEID and the tracing information in the tracing information DB when the trace count value is the same as the trace critical value.

12. (Currently Amended) The method for tracing GTP resource of claim 4, further comprising ~~a step of~~ operating a timer corresponding to a tracing function the duration when the tracing information includes information of the tracing function duration.

13. (Currently Amended) The method for tracing GTP resource of claim 12, wherein further comprising ~~a step of~~ canceling the GTP-U tracing function by deleting the TEID and the tracing information from the tracing information DB when the timer is terminated.

14. (Currently Amended) The method for tracing GTP resource of claim 4, further comprising ~~a step of~~ canceling the GTP-U tracing function when the subscriber call is canceled.

15. (Original) The method for tracing GTP resource of claim 14, wherein the step of canceling the GTP-U tracing function comprises:

transmitting a session termination signal including an identification information of subscriber whose call is cancelled; and

canceling the GTP-U tracing function by deleting the TEID and the tracing information from the tracing information DB using the identification information.

16. (Currently Amended) A method for tracing GTP resource, the GTP trafficked between a SGSN and a GGSN at an exchanger including the SGSN and the GGSN having a call tracing unit, a call manager, a tracing information DB, and GTP-U tracing unit, comprising ~~the~~ steps of:

setting a tracing function for reserved resource of a GTP-U using TEID of a subscriber to be traced; and

detecting the GTP-U having the tracing function set therein and outputting information for the reserved resource of the GTP-U message.

17. (Currently Amended) The method for tracing GTP resource of claim 16, wherein ~~the step of~~ setting the tracing function comprises:

requesting, ~~by a first step of~~ the call tracing unit ~~requesting~~, a GTP-U tracing function registration to the GTP-U tracing unit by transmitting a tracing information for a subscriber received from an operator to the GTP-U tracing unit;

mapping, ~~by a second step of~~ the GTP-U tracing unit ~~mapping~~, the TEID allotted to the subscriber using the tracing information;

registering, ~~by a third step of~~ the GTP-U tracing unit ~~registering~~, the GTP-U tracing function using the TEID and transmitting the TEID to the call tracing unit; and

storing, ~~by a fourth step of~~ the call tracing unit ~~storing~~, the TEID together with the tracing information in the tracing information DB.

18. (Currently Amended) The method for tracing GTP resource of claim 17, further comprising ~~a step of~~ transmitting, ~~by~~ the GTP-U tracing unit ~~transmitting~~, a response message to the request of the GTP-U tracing function registration to the call tracing unit after said requesting ~~the first step~~.

19. (Currently Amended) The method for tracing GTP resource of claim 18, further comprising ~~a step of~~ reporting, ~~by~~ the call tracing unit ~~reporting~~, a failure of the GTP-U tracing function registration to the operator when there is no response message to the request of the GTP-U tracing function registration from the GTP-U tracing unit within a predetermined time.

20. (Currently Amended) The method for tracing GTP resource of claim 17, wherein ~~said mapping the second step~~ further comprises ~~a step of~~ transmitting a response message for notifying a failure of the GTP-U tracing function registration from the GTP-U tracing unit to the call tracing unit and reporting the failure of the GTP-U tracing function registration from the call tracing unit to the operator when the GTP-U tracing unit confirms that the call for the subscriber does not exist by mapping the TEID allotted to the subscriber.

21. (Original) The method for tracing GTP resource of claim 17, wherein the tracing information comprises the IMSI and IP address of the subscriber.

22. (Original) The method for tracing GTP resource of claim 21, wherein the tracing information comprises 2bits indicating SGSN record type and a tracing type for classifying call watching, call tracing, and GTP-U tracing according to the SGSN record type of the 2bits.

23. (Original) The method for tracing GTP resource of claim 17, wherein the tracing information DB stores the tracing information, the TEID, and a trace count value notifying the number of the traced message.

24. (Currently Amended) The method for tracing GTP resource of claim 17, wherein the second step comprises ~~the steps of~~:

converting the tracing information (INSI or IP) received from the call tracing unit to the TEID and storing the converted TEID and the tracing information at the GTP-U tracing unit; and

activating a tracing flag corresponding to the TEID.

25. (Currently Amended) The method for tracing GTP resource of claim 16, wherein ~~the step of~~ outputting the reserved resource information comprises ~~the steps of~~:

confirming the TEID of a trafficked GTP-U at the GTP-U tracing unit;

confirming whether a tracing flag of the TEID is activated by searching the table with the confirmed TEID at the GTP-U tracing unit;

transmitting information for the reserved resource of the GTP-U together with the TEID from the GTP-U tracing unit to the call tracing unit when the tracing flag is activated; and

outputting the reserved resource information from the call tracing unit to the operator using the TEID.

26. (Original) The method for tracing GTP resource of claim 25, wherein the reserved resource information comprises an AMA number of the trafficked GTP-U, an interface number, VPI/VCI, a link band, a value directing a stream direction of the data, and a trace count value.

27. (Currently Amended) The method for tracing GTP resource of claim 25, wherein ~~the step of~~ outputting the reserved resource information to the operator comprises ~~the steps of~~:

confirming whether the TEID received from the GTP-U tracing unit is stored by searching the tracing information DB;

mapping a subscriber tracing information corresponding to the TEID with the reserved resource information and outputting the mapped resource information to the operator when the TEID is stored;

increasing a trace count value in the call tracing information and comparing the trace count value with a trace critical value; and

deleting the TEID and the tracing information from the tracing information DB when the trace count value is the same as the trace critical value.

28. (Original) The method for tracing GTP resource of claim 27, wherein the comparison of trace count value and trace critical value is separately carried out for each of up stream and down stream, and the TEID and the tracing information are deleted from the tracing information DB when the trace count value of one of the up/down stream is the same as the trace critical value.

29. (Currently Amended) The method for tracing GTP resource of claim 17, further comprising ~~a step of~~ operating a timer corresponding to a tracing function duration at the call tracing unit when the TEID is received if the tracing information has information of the tracing function duration.

30. (Currently Amended) The method for tracing GTP resource of claim 29, further comprising ~~a step of~~ canceling the GTP-U tracing function by deleting the TEID and the tracing information from the tracing information DB when the timer is terminated.

31. (Currently Amended) The method for tracing GTP resource of claim 16, further comprising ~~a step of~~ the call tracing unit canceling the GTP-U tracing function when the call of the subscriber is canceled.

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32. (Currently Amended) The method for tracing GTP resource of claim 31, wherein ~~said the step of~~ canceling the GTP-U tracing function comprises ~~the steps of~~:

transmitting a session termination signal having an identification information of the subscriber whose call is canceled from the call manager to the call tracing unit; and

canceling the GTP-U tracing function by deleting the TEID and the tracing information from the tracing information DB using the identification information at the call tracing unit.